CITY OF WESTMINSTER STANDARD REQUIREMENTS FOR DISINFECTION OF NEWLY INSTALLED WATER MAINS

General:
The contractor shall supply all material, labor, equipment, and methods necessary to conduct tests and provide certification of pipeline disinfection from a State-approved laboratory. All tests shall be made in the presence of the City of Westminster's Water Quality Coordinator by a State-approved laboratory technician. All portions of the pipeline under construction shall be isolated from the existing public water system while being tested.

NOTE: All existing City valves shall be solely operated by City crews. Contractor must contact City Water Division 48 hours prior to shut down, tie-ins, etc., to schedule operating said valves. Water Division phone number is (714) 895-2876, ext. 6206.

Scope:
All new water mains shall be disinfected before they are placed into service. All water mains taken out of service for any reason shall be flushed and disinfected before they are returned to service.

Keep pipes clean and dry:
Precautions shall be taken to protect the interiors of pipes, fittings, and valves against contamination. Pipe delivered for installation to the water system shall be delivered so as to minimize the entrance of foreign material. All openings in the pipeline shall be closed with water-tight plugs at the close of the work day or at any other time work to that section of pipeline stops or when it will be left unattended for any length of time. If water accumulates in the trench, the plugs shall remain in place until the trench is dry. Sections of pipe not being used in a day's work shall have the ends covered to guard against contamination of any kind.

Sealing materials:
No contaminated material or any material capable of supporting prolific growth of microorganisms shall be used for sealing joints. Sealing material or gaskets shall be handled in a manner that avoids contamination. The lubricant used in the installation of sealing gaskets shall be suitable for use in potable water.

Cleaning and swabbing:
If dirt or other debris enters the pipe, it shall be removed and the interior pipe surface swabbed clean with a one percent Hypochlorite disinfecting solution.

Flooding by storm or accident during construction:
If the main is flooded during construction, it shall be cleared of the flood-water and flushed with potable water until it is clean. The section exposed to the flood-water shall be filled with potable water which shall be chlorinated sufficiently that, at the end of a 24 hours holding period, it will have a free chlorine residual of not less than 25 mg/L. The chlorinated water may then be drained or flushed from the main. After construction is completed, the main shall be disinfected using the continuous-feed or slug method.

CITY OF WESTMINSTER STANDARD REQUIREMENTS FOR DISINFECTION OF NEWLY INSTALLED WATER MAINS (CONTINUED)

Disinfection:
All water mains, water services, attached appurtenances, and connections shall be disinfected in accordance with AWWA Standard C651-92 for "Disinfecting Water Mains" as modified herein. In case of any conflict, the requirements of this standard will prevail.

The contractor shall ensure that all pipes, fittings, and appurtenances are kept free from dirt, rodents, foreign matter, etc., **at all times**.

During the disinfection process, all valves shall be operated, and the chlorine solution shall be drawn through all laterals and appurtenances, using every precaution not to contaminate the public water system with the highly chlorinated water.

Disinfection shall be accomplished by using the **"tablet"** method, unless otherwise approved by the Water Quality Coordinator. The Calcium Hypochlorite tablets shall be glued (using only FDA approved food grade adhesives) to the inside top of both ends of the newly installed sections of pipe. City crews shall very slowly add potable water from the City's system to load the main.

The chlorine tablets used in the disinfection process shall produce a residual of not less than 50 mg/L in all sections of the pipeline and all appurtenances being disinfected (see Table 1).

Allow the chlorinated water to stand for 24 hours. Then sample for a chlorine residual. This residual must be 25 mg/L **Free chlorine** or greater. If less than 25 mg/L is indicated, the line shall be flushed and the sterilization procedure shall be repeated until all test requirements are met.

TABLE 1

Number of 5-g Calcium Hypochlorite Tablets required for dose of 25 mg/L*						
		Length of pipe section, ft (m)				
		13 (4.0) or less	18 (-5.5)	20 (-6.1)	30 (-9.1)	40 (-12.2)
Pipe diameter						
inches	(mm)	Number of 5-g Calcium Hypochlorite Tablets				
4	100	1	1	1	1	1
6	150	1	1	1	2	2
8	200	1	2	2	3	4
10	250	2	3	3	4	5
12	300	3	4	4	6	7
16	400	4	5	7	10	13

* Based on 3.25-g available chlorine per tablet: any portion of tablet rounded to next higher integer.

CITY OF WESTMINSTER STANDARD REQUIREMENTS FOR DISINFECTION OF NEWLY INSTALLED WATER MAINS (CONTINUED)

Flushing and Bacteriological testing:
Following the chlorination period of 24 hours, the water shall be flushed from the main at its extremities and at all outlets until the chlorine residual of the water being flushed equals that of the public water system which is typically no higher than 2.0 mg/L **"Total" Chlorine**, in most cases.

The contractor shall have a State certified laboratory technician perform the bacteriological test.
Samples shall be taken at the direction of the City of Westminster's Water Quality Coordinator with at least one sample taken from each dead-end main section. Samples shall be taken 24 or more hours after final flushing. All samples must show absence of coliform and E-Coli organisms, and each Heterotrophic Plate Count (HPC) shall be less than 20.

Abbreviated Procedure for Disinfecting mainlines
(See "Disinfection" portion of this document for details):

1. Keep all pipe and appurtenances clean and dry, free of contamination.
2. Removing such materials which may have entered the water main.
3. Glue chlorine tablets to the inside top of pipe ends (dose 50 mg/L or greater).
4. Very slowly load new main with system water.
5. Let stand for 24 hours.
6. Take residual (must be at least 25mg/L, if not start over).
7. Flush main to system residual (less than or equal to 2.0 mg/L)
8. Let stand for 24 hours.
9. Laboratory technician draws 2X 100 mL samples in presence of Water Quality Coordinator and takes to State approved laboratory.
10. Results from laboratory must be coliform and E-Coli absent, and heterotrophic plate counts must be less than 20.
11. Submit clear, legible copy of laboratory results to the City of Westminster's Water Quality coordinator and followed up by a certified (seal of laboratory) hard copy to same.
12. Have Water Quality Coordinator approve connecting to City's system.
13. Have City crews connect – reconnect newly sampled pipes to system.

Record of compliance:
Bacteriological samples shall be taken after repairs / installations are completed (but prior to connecting to City water system) to provide a record for determining the procedure's effectiveness. The record of compliance shall be the bacteriological test results certifying the water sampled from the water main to be free of coliform and E-Coli bacteria contamination, and heterotrophic plate count must be less than 20.

Definitions:

Continuous Feed or Slug Method
At a point not more than 10 feet (3m) downstream from the beginning of the newly repaired / installed main, water entering that main shall receive a dose of chlorine fed at a constant rate such that the water will have not less than 100 mg/L free chlorine. To ensure that this concentration is achieved, the chlorine concentration should be measured at regular intervals. The chlorine shall be applied continuously and for a sufficient period to develop a solid column or "slug" of chlorinated water that will, as it moves through the main, expose all interior surfaces to a concentration of approximately 100 mg/L for at least 3 hours.

CITY OF WESTMINSTER STANDARD REQUIREMENTS FOR DISINFECTION OF NEWLY INSTALLED WATER MAINS (CONTINUED)

Tablets Method
The tablet method consists of gluing calcium hypochlorite tablets to the inside top of each end of the water main as it is being installed and then filling the main with potable water when installation is completed.

Also, one such tablet shall be placed in each hydrant, hydrant branch, and other appurtenances. The Calcium Hypochlorite tablets shall be glued (using only FDA approved food grade adhesives). City crews shall very slowly add potable water from the City's system to load the main.

The number of 5-g tablets required for each pipe section shall be $0.0012\ d^2L$ rounded to the next higher integer, where the d is the inside pipe diameter, in inches, and L is the length of the pipe section, in feet (see table 1).

Free Chlorine
Free available residual chlorine is free in the sense that it has not reacted with anything and is available in that it can and will react if need be. It has not yet combined with any other chemicals in drinking water such as ammonia to form ***Total Chlorine.*** ***Free chlorine*** is faster reacting disinfectant than other forms of chlorine.

Total Chlorine
Total or Combined chlorine is ***Free chlorine*** which has combined with natural or added ammonia or other chemicals in drinking water. It still has disinfecting abilities; however it is slower reacting than ***Free Chlorine.***